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Evaluation Of The Nutritive Value Of Pinapple Wastes And Malted Sorphum Sprouts Based Diet On Pigs

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A B S T R A C T

The study was conducted to evaluate the nutritive value of Pineapple waste and malted sorghum sprout (PWMSM or MSPW) based diet on pigs. The experiment was conducted at the Swine unit of the Teaching and Research Farm, University of Uyo, Uyo, AkwaIbom State. The malted sorghum sprout and pineapple waste was at ratio 1:2 (weight/weight) respectively. A total of 40 grower pigs of large white were used for the study. The pigs were divided into 4 groups based on average initial weights (20-25kg) and each group of grower pigs were respectively allocated to each of the four treatment diets using a completely randomized design (CRD). Each treatment group contained 2 replicates of 10 pigs 5male and 5female). These pigs were fed twice daily and water supplied ad-libitium. Four diets were formulated to contain 0%, 20%, 40% and 60% of MSPW. Data were collected on growth performance and blood profile. Result revealed that there was no significant (P>0.05) differences on all the growth performance parameters measured. The highest value of average daily weight gain (19.21 g/day) was observed in pigs fed 20% MSPW while the lowest value was obtained in pigs fed 40% MSPW pigs placed on 20% MSPW had the best feed conversion ratio value . (17.15). No significant differences (P>0.05) were observed on all blood profile parameters measured except the albumin and creatinine. The albumin and creatinine values ranged from 2.63-3.52 g/dl and 0.90- 1.50mg/dl respectively. It can be concluded that grower pigs fed 20% MSPW based diet yielded best results in terms of performance and there was no detrimental effect on their blood profile. Implications and recommendations were made from the findings of the study.

Keywords: *Malted Sorghum Sprout, Pineapple, Performance, Serum Biochemistry, Pigs.*

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INTRODUCTION:

Inadequate feeds are the major issues which farmers in Nigeria face generally. Even the few available ones gradually becomes imbalance and low nutritive value during the dry season period [1]. To mitigate this incessant problem of high feed cost and inadequate feeds, there is need to continuously search for various alternative feeds that are less competitive for its use by man and other livestock which could perhaps be one of the intervention areas needed to enhance the proliferation of small non- ruminants. Examples of such agro- industrial by-products are pineapple waste (PNW) and Malted sorghum sprout (MSP).The use of several crop residues (maize cobs and husk, cassava peel, etc.), other agricultural by-products (vinnase, malted sorghum sprouts, grape pomace, etc.) and browse plants to improve livestock production in the Tropics has been well documented [2]; Yusuf *et al.*[3], Saka et al[4].

Pineapple waste is a byproduct from pineapple processing industry and about 30% of the pineapples are turned into waste during the canning operation [5]. It consists of residual pulp, peels, skin and contains mainly sucrose, fructose, glucose and other nutrients [6], [4]. These wastes can cause environmental pollution problems if not utilized.

Malted sorghum sprouts (MSP), a non-conventional feedstuff with a high nutritive profile, has been established to be useful feed source in rabbits [7], pigs [8] and birds [9]. Saka*et al.* [10] reported that MSP contained 88.79% dry matter 6.38% crude protein 2.35% ether extract

5.21% ash 51.06% nitrogen-free extract 49.57% neutral detergent extract, 31.25% acid detergent fibre, 3.92% acid detergent lignin, 18.32% hemicellulose and 27.33% cellulose. The anti- nutritional factors, including tannin, cyanogenicglucoside, phytic acid, trypsin inhibitor, and oxalate, were reportedly found in MSP [11]. Waghorn [12] reported that tannin affected animal performance as it caused a reduction in feed intake and diet degradability. Detoxifying non-conventional feedstuffs might be a good means of reducing the level of anti-nutritional factors and thus increases the nutritive value of MSP [13]. The fermentation of MSP was reported to reduce the anti-nutritional factors as it increased the digestibility of plant proteins [14]. In Nigeria, little is known about the nutritive combination of pineapple waste and malted sorghum sprout on pigs. Therefore, this study is aimed at evaluating the nutritive value of pineapple waste and malted sorghum sprouts on pigs.

METHODS AND MATERIALS:

Location of study-

The study was carried at the piggery unit of the Research Farm, University of Uyo, Uyo, AkwaIbom State. AkwaIbom state is in Nigeria. Akwa Ibom State is located in the coastal southern part of the country, lying between latitudes $4^{0}32^{1}$N and $5^{0}33^{1}$N, and longitudes $7^{0}25^{1}$E and $8^{0}25^{1}$E. The state is located in the south-South geographical zone, and is bordered on the east by Cross River State and Rivers State,, on the west by Abia state, and on the south by Atlantic Ocean and the south-most tip of Cross Rivers State.

Collection and preparation of test ingredients-

Malted Sorghum sprout were obtained from Live Care Sorghum Processing Industry, Sango Otta, Abeokuta, Ogun State. Fresh wet pineapple waste was obtained from fruit sellers in Uyo, opposite University of Uyo main gate precisely. Fresh wet pineapple waste was thoroughly hand mixed with malted sorghum sprout accordingly to earlier specified ratio (6). Thereafter, the mixture was spread for (5 -7 days) on the concrete floor to sun dry. After it was properly dried, it was thereafter milled and then mixed with other ingredients at varying levels of 0%, 20%, 40% and 60% to formulate four dietary treatments: T1, T2, T3 and T4 respectively.

Experimental Animals-

A total of 40 grower pigs of large white were used for the study. The pigs were divided into 4 groups based on average initial weights (20-25kg) and each group of grower pigs were respectively allocated to each of the five treatment diets in a completely randomized design (CRD). Each treatment group contained 2 replicates of 10 pigs (5male and 5female). These pigs were fed twice daily and water supplied ad-libitium.

Data Collection-

Feed Intake and Live Weight Gain**:** At the beginning of the experiment, the pigs were weighed and subsequently on a weekly basis prior to feeding in the morning. The initial live weight was subtracted from the final live weight to determine the weight gained by the animals. Feeds offered and remnants were weighed daily to determine the feed intake of the animals. Both values were used to determine Feed Conversion Ratio (FCR).

STATISTICAL ANALYSIS:

Data were subjected to analysis of variance using the procedure outlined by SAS (2002) and significantly different means were separated using the Multiple range test by Duncan.

RESULT AND DISCUSSION:

Table1.Composition of Experimental Diet for GrowerPig

Ingredients	**T1 (0%)**	**T2(20%)**	**T3 (40%)**	**T4 (60%)**
Maize	60.00	40.00	20.00	0.00
MSPW	0.00	20.00	40.00	60.00
Wheat Offal	34.10	34.72	34.51	34.25
Bone Meal	1.50	1.50	1.50	1.50
Limestone	2.00	2.00	2.00	2.00
Weaner Premix*	0.25	0.25	0.25	0.25
Salt	0.35	0.35	0.35	0.35
Ronozyme**	0.20	0.20	0.20	0.20
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis:				
Dry Matter	92.0	89.2	88.8	87.2

	0	3	3	8
Crude Protein (%)	**19.00**	**21.00**	**23.00**	**25.00**
Ether extract	**7.48**	**5.19**	**4.58**	**2.60**
ME (Keal/Kg)	**2878**	**2857**	**2835**	**2813**
Fibre (%)	5.35	6.99	8.63	10.26
Ash (%)	5.94	9.11	12.34	15.57
NFE	36.23	40.23	42.48	44.25
NDE	70.21	65.43	54.06	46.32
ADL	46.01	34.23	25.28	33.23
Cellulose	34.00	23.98	13.32	22.99
Hemicellulose	26.32	28.86	26.99	13.34

MSPW: Malted Sorghum Sprout mixed with Pineapple Waste

Table 1 above is the percentage and chemical composition of the experimental concentrate diets. The dry matter ranged from 87.27% - 92.00%. The high dry matter values observed in this study implied that they can be stored all-year round and used as feeds for all ruminant livestock. The crude protein values of the experimental diets increased as the inclusion level of MSPW increased across the dietary treatment. This might be as a result of the high crude protein of malted sorghum sprout in the diet. The crude protein values observed in this study were higher than 10 to 12% crude protein moderate level required by ruminants for minimum growth performance. The highest percentage of NDF, ADF and ADL was obtained in T3 while T4 had the lowest percentage of NDF and ADL. The lowest value of ADF was obtained in T3. The fibre fraction NDF, ADF, ADL and Cellulose were observed to decrease with increasing levels of MSPW. This might be as a result of low fibre content of MSPW in the diet.

Table 2: Growth Performance characteristics of pigs fed experimental diet

Levels of inclusion (%)					
	0	**20**	**40**	60	
Parameters	**1**	**2**	**3**	**4**	**SEM (±)**
Ave.initial weight(kg)	10.05	9.98	10.00	10.01	
Ave.final weight(kg)	28.84^{b}	30.67^{a}	35.00^{c}	38.50^{d}	0.46
Ave.total weight gain(kg)	12.52^{b}	23.79^{a}	27.00^{d}	30.50$^{c d}$	0.44
Ave.daily weight gain(kg)	3.07^{b}	3.40^{a}	3.86^{c}	4.78$^{c d}$	0.64
Feedintake(kg)	35.00	35.00	35.00	35.00	0.01
Feed conversion ratio	2.41^{c}	2.06^{d}	2.69^{b}	2.80^{b}	0.68
Protein efficiency ratio	2.18^{b}	2.52^{a}	1.95^{c}	1.88$^{c d}$	0.08
Mortality(%)	-	-	-	-	-

a , b, c, d, e means along the same row with different superscripts are significantly (p< 0.05) different from each at her, Ave: Average, SEM: Standard error of mean.

Table 2 above shows the performance characteristics of grower pigs fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW). There was a significant (P>0.05) differences in all the parameters measured in this study. However the final body weights reported in this study were within the range of 7.60 – 9.05 kg reported by [15]. The observed higher daily weight gain value with 60% MSPW might be as a result of the ability of the pigs to properly utilize the diet for bodyweight gain when compared with other dietary treatments. This was not in consonance with the result of [16]. The pigs placed on T (60% 4 MSPW) had the best MSPW. However, the low MSPW value obtained in this group might be attributed to the fact that the nutrients were better utilized.

Table 3: Hematological indices of parameter of grower pigs fed with Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) Based Diet

Parameters	**A**	**B**	**C**	**D**	**SEM**
HB(g/dl)	8.97	8.77	9.68	9.73	0.88
PVC(%)	33.08	31.63	31.88	31.88	2.66
RBC(x106/UL)	2.56	2.59	2.69	2.53	0.27
MCV(fl)	131.98^{a}	125.18^{b}	126.85^{ab}	126.85$^{a b}$	5.23
MCH(pg)	38.88^{a}	38.88^{b}	37.53^{b}	37.53^{b}	1.19
MCHC(%)	29.03^{b}	31.02^{a}	29.33^{b}	29.55^{a} ^{b}	1.38
PLT(x103/UL	22.67	20.83^{a}	18.33	20.50^{a}	1.37

)	a		a		
WBC (x103/UL)	83.78a	73.13 ab	82.00a b	75.33b	6.15
LYM (%)	77.67c	83.83 abc	81.00b c	87.67a b	7.76
NEUT (%)	22.33a	16.17 abc	19.00a b	12.33b c	8.00

a,b,c Means in the same row with different super script are significantly different

Table 4 above shows the hematological parameters of grower pigs fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) based diet. There were no significant (P>0.05) differences in all the parameters measured. The packed cell volume (PCV), hemoglobin, red blood cell (RBC) and white blood cell values (WBC) decreased numerically across the dietary treatments as the inclusion of MSPW increased. The values observed for pack cell volume (PCV) in this study fell within the range of values (15.0 -30.0%) reported by [17]. The variation in PCV values obtained in this study might be associated with the location, environmental and nutritional stress as being suggested by [18]. The hemoglobin values of the experimental animals on 0% to 60% MSPW inclusion level were in agreement with the reports of [19]; [20]. Since hemoglobin function as a carrier of oxygen to target organs by forming oxyhaemoglobin hence animals on 0% to 60% MSPW inclusion are at advantage. The values of red blood cell (RBC) reported herein agreed with the values reported by [17] for similar animal. The value of the white blood cell (WBC) obtained in this study

supported the reports of Beliku, that grower pigs possess a protective system providing a rapid and potent defense against any infectious agent and this probably form the physiological basis for the adaptation of the West African eco-zone which is characterized with high prevalence of diseases. This probably shows that animals placed on 0% to 60% MSPW inclusion levels, maintained an active immune system that defends the body against infection, allergic reactions, parasites and antigens.

Table 5: Serum chemistry of experimental Pigs fed with Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) Based Diet

Parameters	Diet 1 (0%)	Diet 2 (20%)	Diet 3 (40%)	Diet 4 (60%)	SEM
Calcium (Mg/dl)	10.15 a	9.72 a	8.97 b	8.43 b	0.52
Phosphate (Mg/dl)	2.65 a b	2.13 b c	2.68 a	2.09 c	0.45
Glucose (Mg/dl)	143.07	152.50	156.02	145.00	27.08
Uric acid (Mg/dl)	2.80 b	2.32 c	3.57 a	2.18 c	0.46
Cholesterol (Mg/dl)	92.52	99.18	105.85	106.37	15.77
Triglyceride (Mg/dl)	20.42	24.90	27.25	24.38	35.88
Cl (Mmol/L)	119.40	112.70	104.83	104.77	21.47
Na (Mmol/L)	145.00	143.77	135.68	137.72	20.30
K (Mmol/L)	5.30 a	4.88 a b	3.98 b	4.37 a b	0.88
HC03 (Mmol/L)	28.83	28.50	26.50	28.33	2.15
Urea (Mg/dl)	10.40 c	12.03 a b	12.50 a	12.40 a	1.45
Creatinine (Mg/dl)	0.24 b	0.35 a	0.28 a b	0.30 a b	0.04
Total Bilirubin (Mg/dl)	0.11	0.13	0.07	0.13	0.08
Conj. Bilirubin (Mg/dl)	0.05 a	0.06 a	0.03b c	0.02 c	0.01
ALT (IU/L)	2.50	2.42	2.50	2.42	0.211
AST (IU/L)	35.22 a	22.27 c	32.38 a b	21.00 c	0.63
ALP (IU/L)	175.10	163.40	157.90	156.31	553.30

a, ab Means with different superscripts along the same row are significantly different (P<0.05) BUN: Blood Urea Nitrogen, AST: Aspartate Aminotransferase, ALT: Alanine Aminotransferase
*Merck Veternary Manual, 2015

Table 5 above shows the Serum Biochemical Indices of grower pigs fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW). There were no significant differences (P > 0.05) in all the parameters observed in this study except for albumin, Conj. Bilirubin and creatinine. Pigs fed T (40% MSPW) 3 exhibited the highest values of albumin (3.52g/dl) while the lowest value of (2.63g/dl) was observed in those fed T 2 (20% MPSW) [21] reported that albumin is an important blood clot factor due to its ability to prevent hemorrhage, therefore the higher the value, the better it is for the animals. However the values observed in this study were within the normal range recommended for a normal healthy pigs. The creatinine values obtained in this study varied significantly across the dietary treatments in which the highest value (1.50mg/dl) was obtained in goats fed T1 (0% MSPW) while the lowest value (0.90mg/dl) was observed in pigs fed T 3 (40% MSPW). The creatinine values obtained in this study fell within the normal range of values (0.7-1.5 mg/dl) reported by Fraser et al,(2016) but significantly higher than values reported by Ikhimioya et al, [23] for an healthy grower pigs. Prvulovic et al, [23] reported that creatinine level in serum has direct correlation with muscle mass and kidney

function in animals. It was general concluded that Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) Based Diet has a very nutritive value for growing pigs.

CONCLUSION:

This study was conducted to evaluate the the nutritive value of pineapple waste and malted sorghum sprouts on pigs. A total of 40 grower pigs of large white were randomly selected at the Swine unit of the Teaching and Research Farm, University of Uyo, Uyo, AkwaIbom State and used for the study. The pigs were divided into 4 groups based on average initial weights (20-25kg) and each group of grower pigs were respectively allocated to each of the four treatment diets in a completely randomized design (CRD). Each treatment group contained 2 replicates of 10 pigs (5male and 5female). These pigs were fed twice daily and water supplied adlibitium. The treatment diets consisted of the following of pineapple waste mixed with malted sorghum meal at 0 (controlled), 20, 40, 60% replacement of maize in the control diet were formulated. The study utilized a randomized design and the statistics used in analyzing the result in the study were mean+stem and one way Analysis of variance (ANOVA).

Data were collected on growth performance and blood profile. Result revealed that there was no significant ($P>0.05$) differences on all the growth performance parameters measured. The highest value of average daily weight gain (19.21 g/day) was observed in pigs fed 20% MSPW while the lowest value was obtained in goats fed 40% MSPW pigs placed on 20% MSPW had the best feed conversion ratio value . (17.15). No significant differences ($P>0.05$) were observed on

all blood profile parameters measured except the albumin and creatinine. The albumin and creatinine values ranged from 2.63-3.52 g/dl and 0.90- 1.50mg/dl respectively. It can be concluded that grower pigs fed 20% MSPW based diet yielded best results in terms of performance and there was no detrimental effect on their blood profile. It is therefore recommended that MSPW;

I. Should be encouraged in the feeding of pigs to reduce over dependence of maize feeds by our farmers which have led to high cost of raising monogastrics specifically pigs which thereby discouraged farmers from investing in the swine business.
II. Public extension/ advisory staff should be mobilized to convey these results to practicing farmers.

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